

S.N. 09/929,849

Attorney Docket No. 2001-0128.00
(56202.US/4665.0)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Brian C. Hart et al.
Application No.: 09/929,849
Filing Date: August 14, 2001
Confirmation No.: 9848
Title: METHOD FOR MAKING INKJET PRINTHEADS
Examiner: R. P. Culbert
Group Art Unit: 1763

FAX RECEIVED
FEB 10 2003
GROUP 1700DECLARATION OF SHAUNA M. LEIS UNDER 37 C.F.R. §1.131Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I, Shauna M. Leis, declare that:

1. I am over 18 years of age and one of the named co-inventors in the U.S. patent application identified above and I make this declaration based upon personal knowledge of the facts stated herein.
2. I am currently employed by the assignee, Lexmark International, Inc., in Lexington, Kentucky as a Chemical engineer.
3. I graduated in 1997 from the University of Louisville with a B.S. degree in Chemical Engineering and obtained an M.Eng in Chemical Engineering from the University of Louisville in 1998.

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4. I am intimately familiar with the above referenced application, the office actions dated October 29, 2002, and January 13, 2003, and, in particular, with U.S. Patent No. 6,402,301 to Powers et al. relating to ink jet printheads and methods for making printheads.

5. Prior to October 27, 2000, the invention was conceived as described and claimed in Claims 1-18 of the above reference application in this country as evidenced by Invention Disclosure No. 0239 signed by me, Brian C. Hart and Gary R. Williams, and witnessed by G. Patil and Colin Maher. All of the dates redacted from the invention disclosure were before October 27, 2000, the filing date of the '301 patent.

6. As further evidence of the reduction to practice of the invention, I am attaching copies of my relevant notebook pages. As shown by the attached pages, wafers were coated on two different dates with polyacrylamide (PAM) and polyethylene oxide (PEO) before grit blasting or etching the wafers with reactive ion etching (RIE). Each of the wafers contained a water insoluble photoresist layer referred to as LEXFILM. The PAM was a 50 wt. % solution in water that was spun coated onto the wafer at 1500 rpm for 30 seconds. The PEO was coated onto the wafer from a 7 wt.% solution of PEO. The PEO was found to protect the wafer well and remove cleanly after grit blasting the wafer. The dates redacted from the page marked 1 were before October 27, 2000. Wafers coated with PEO from a 7 wt.% solution are shown in Figs. 1-3.

7. Less than a month later, a wafer containing a LEXFILM layer was coated with a solution made from 80 milliliters of 50 wt.% PAM in water and 10 mL of water, then the wafer was grit blasted. There was a 3% yield improvement using the PAM coating to protect the wafer. The date redacted from the page marked 2 was also before October 27, 2000.

8. Before October 27, 2000, wafer coating experiments were conducted as set forth on the notebook page marked 3. In these experiments, each wafer contained a

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LEXFILM layer. The wafers were plasma cleaned at 100 watts for 30 seconds. Water soluble layers were then spun coated at 1400 rpm for 20 seconds from a 50 wt.% solution, a 25 wt.% solution, a 12 wt.% solution, and a 6 wt.% solution of PAM in water. The corresponding coating layer thicknesses were 25-27 microns for the 50 wt.% solution, 20 microns for the 25 wt.% solution, and 10 microns for the 12 wt.% solution.

9. On the notebook page marked 4, wafers containing a LEXFILM layer were coated with 7 wt. % PEO less than two months after October 27, 2000. The PEO had a molecular weight of 400,000. The first wafer was spun-coated at 1000 rpm for 60 seconds and had a coating thickness of 10 microns. The second wafer was spun-coated at 750 rpm for 60 seconds and had a coating thickness of 13 microns. A wafer coated with 7 wt.% PEO after grit blasting and RIE etching is shown in Fig. 4. In this figure, the PEO coating has already been removed with water after the process was completed.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: 02/05/03

Shauna M. Leis
Shauna M. Leis

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Coating wheels w/ 50/50 PAM w/ 4 days
 Triton XL-80W splashy on blank water
 at 1500 rpm : 20 sec
 still splashy

Talked w/ Brad Beath - he's suggested using
 material called Silwet as surfactant at 0.1% or try
 hexane diol at 5%

to get 0.1% $\frac{x}{75 \text{ mL}} = 0.001 \rightarrow x =$

$$\frac{x}{75 \text{ mL}} = 0.001 \Rightarrow x = 3.75 \text{ mL}$$

Coated maple wheels w/ 7% PEO coating
 to protect during grit blast and then RIE

protected well and removed cleanly after grit blast

difficult to inspect after grit blast through
 coating; look into new optica for inspection
 tool

Coating appeared thin though, try larger molecular
 weight PEO

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To coat yellowstone wifer - used 80 ml PAM 5450
10 ml water (2 drops of hexanedid)

then sent through gritblast \Rightarrow 32% yield improvement

TCC

testing for temp max to 150°C

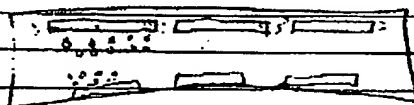
75°	100°	150°
0:20	04:00	08:30

Cycle A completed, cycle B completed, cycle C completed
cycle E completed, cycle D could not start

for the app:

	75°	100°	150°	Valve 1	Valve 2
cycle B to	00:00	01:00	01:00	off	off
Cycle C to	00:00	04:00	01:00	off	off
cycle E to	00:00	07:00	01:00	off	off
cycle A to	00:00	07:00	01:00	off	off

run cycle A - approximately 10°C difference from
inside circle to outer circle for thermocouple wires



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~~Busch NP/chip assemblies
 'in' in TCB at 90°C : 40 psi
 large void areas
 put some in pressure vessel for cure
 and some in VEM 2 min hold (90, 100, 110, 120, 130, 140, 150, 160, 175 - 10 min)
 put strength on VEM low at 70 g. still large voids
 may need to adjust for different material
 (170.5 instead of regular 270.5)
 final VEM temperature may be a bit hot for 170.5
 (100°C)~~

~~Washed at 100°C~~

~~PVA1 - too dirty fingers~~

~~PVA2 - same~~

~~PAM2 - very bad~~

~~PAM1 - not as bad, but bad~~

~~PAM3 - very bad~~

~~PEO2 - very bad~~

~~PEO1 - very bad~~

* Water coating experiments

Solution	at	rpm	and	sec	thickness
50/50 solution	at	1400	rpm	and 20 sec	25-27 μ m
15% solution	at	"	"	"	20 μ m
10% solution	at	"	"	"	10 μ m

thickened for water coating

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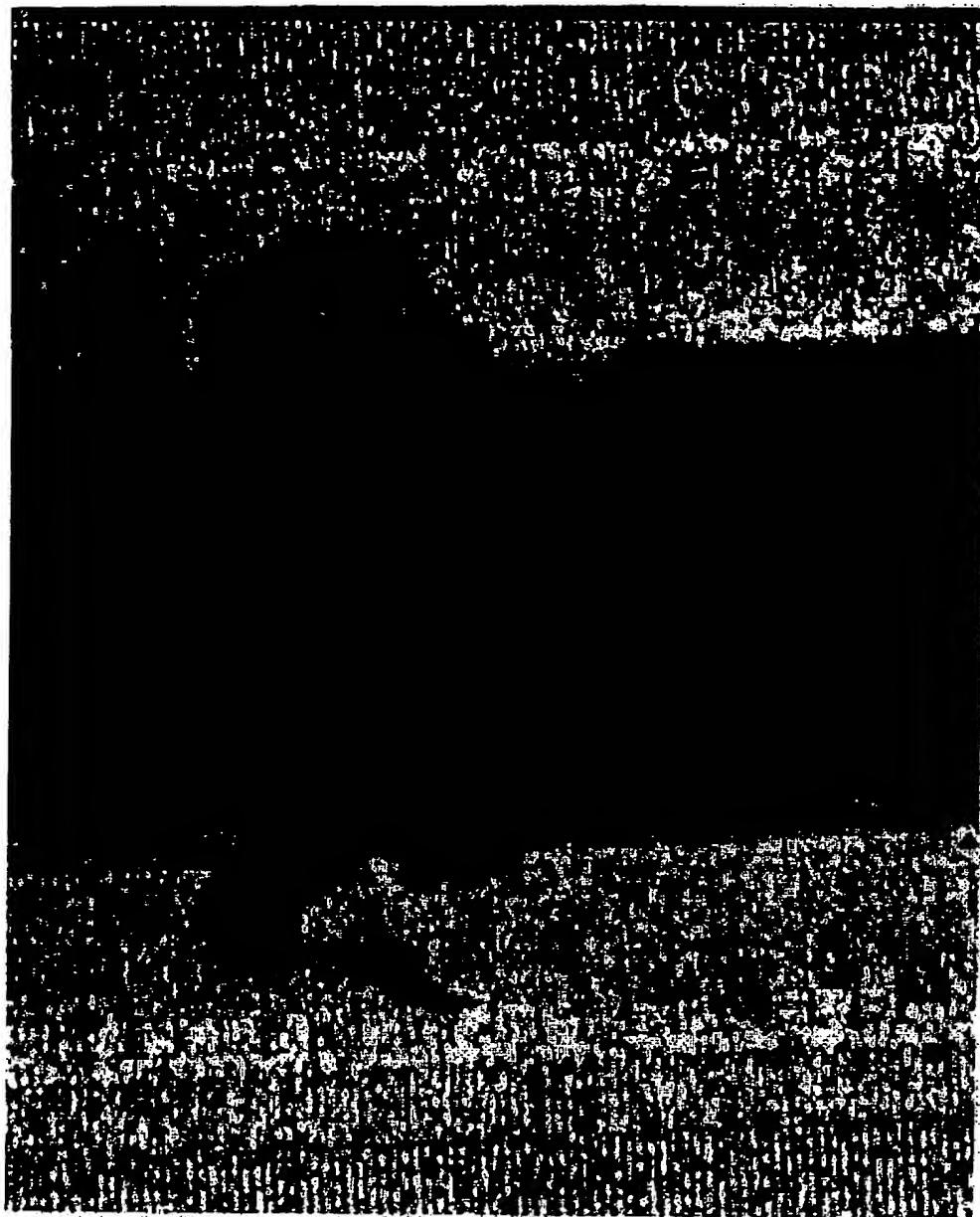
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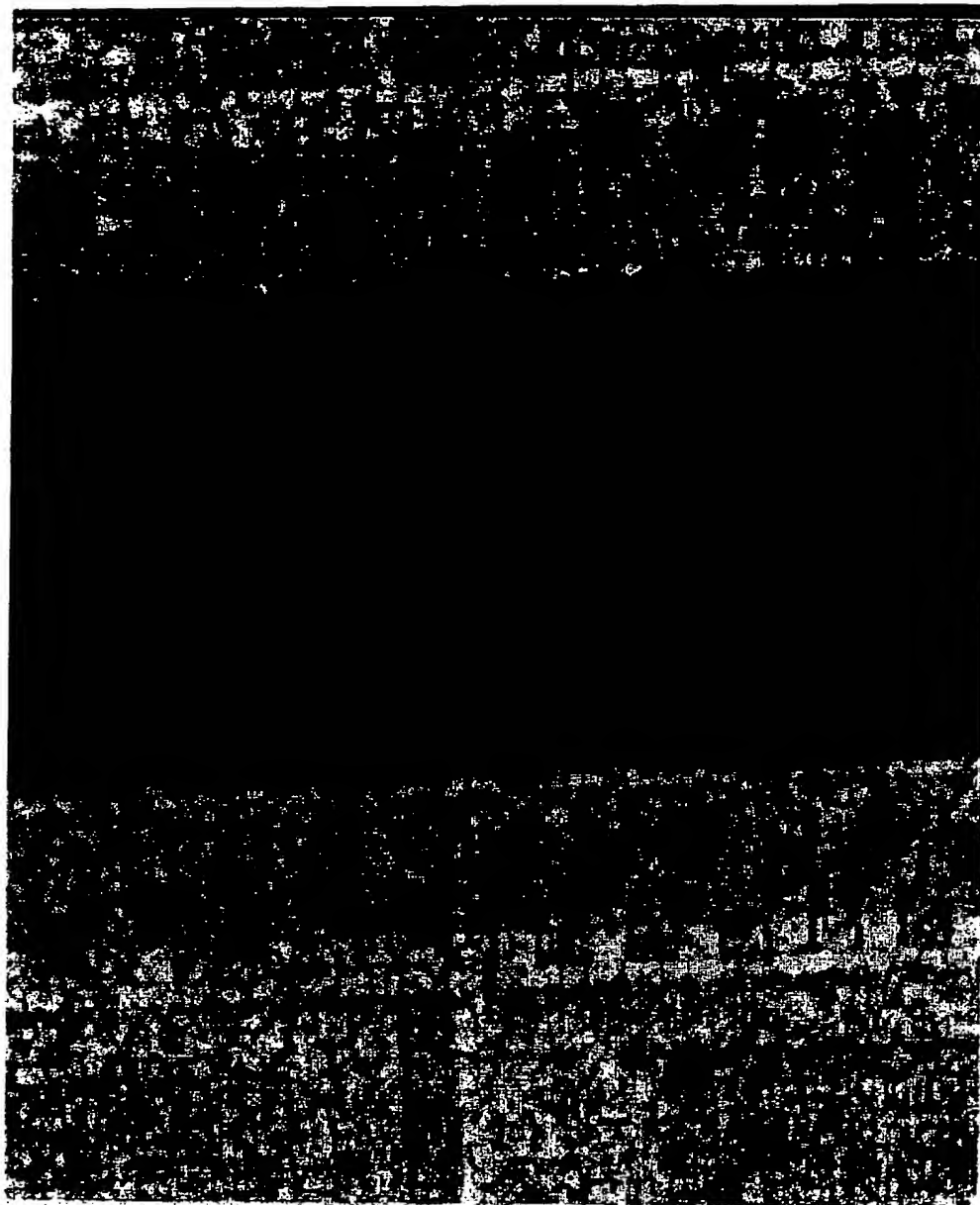
~~No phenolic adhesion wafers~~~~Birch Lase Resal wafers w/ Kapton 100 HPP-ST, 100E, 100 KV~~~~Oak w/ Thick Zepellon w/ 7-6032 & other silane
then Kapton HPP, Kapton E, Kapton KV, RIE Etch.~~~~1% solution 100 mL reagent alcohol, 30 dpc water
1.01 g silane solution
 $0.01 = \frac{0.01X}{100 + X} \rightarrow 0.01 = \frac{0.01}{100 + 2X} \rightarrow 0.01 = \frac{2X}{100 + 2X} \rightarrow 1 + 0.02X = 2X \rightarrow 1 = 1.98X \rightarrow X = 0.5$~~ ~~3% solution
 $0.03 = \frac{X}{100 + X} \rightarrow 0.03 = \frac{0.03}{100 + 2X} \rightarrow 3 + 0.06X = 0.03X \rightarrow 3 = 0.03X \rightarrow X = 100$
 $X = 1.55 g$~~ ~~7% PEO MW 400K 1000 rpm thickness ~ 10 μ m~~~~7% PEO MW 400K 750 rpm thickness ~ 13 μ m~~~~use this to coat wafers during gritblast protection~~~~Blank wafers w/ Lase Resal
~5% 7-6032 solution applied, air 2 minutes
spin 1500 rpm 1 minute
bake 100°C 5 minutes~~~~Sample 4 Ed~~

- ~~- (1) Lase Resal TCB cure, wash
 - (2) Lase Resal (Hatch) 3% silane layer, 2 min jet, spin 1200 rpm 1 minute, 65°C bake 2 minutes
 - (3) Lase Resal (patterned) 5% silane layer, 2 min jet spin 1500 rpm 1 min, 110°C bake 5 minutes, wash~~



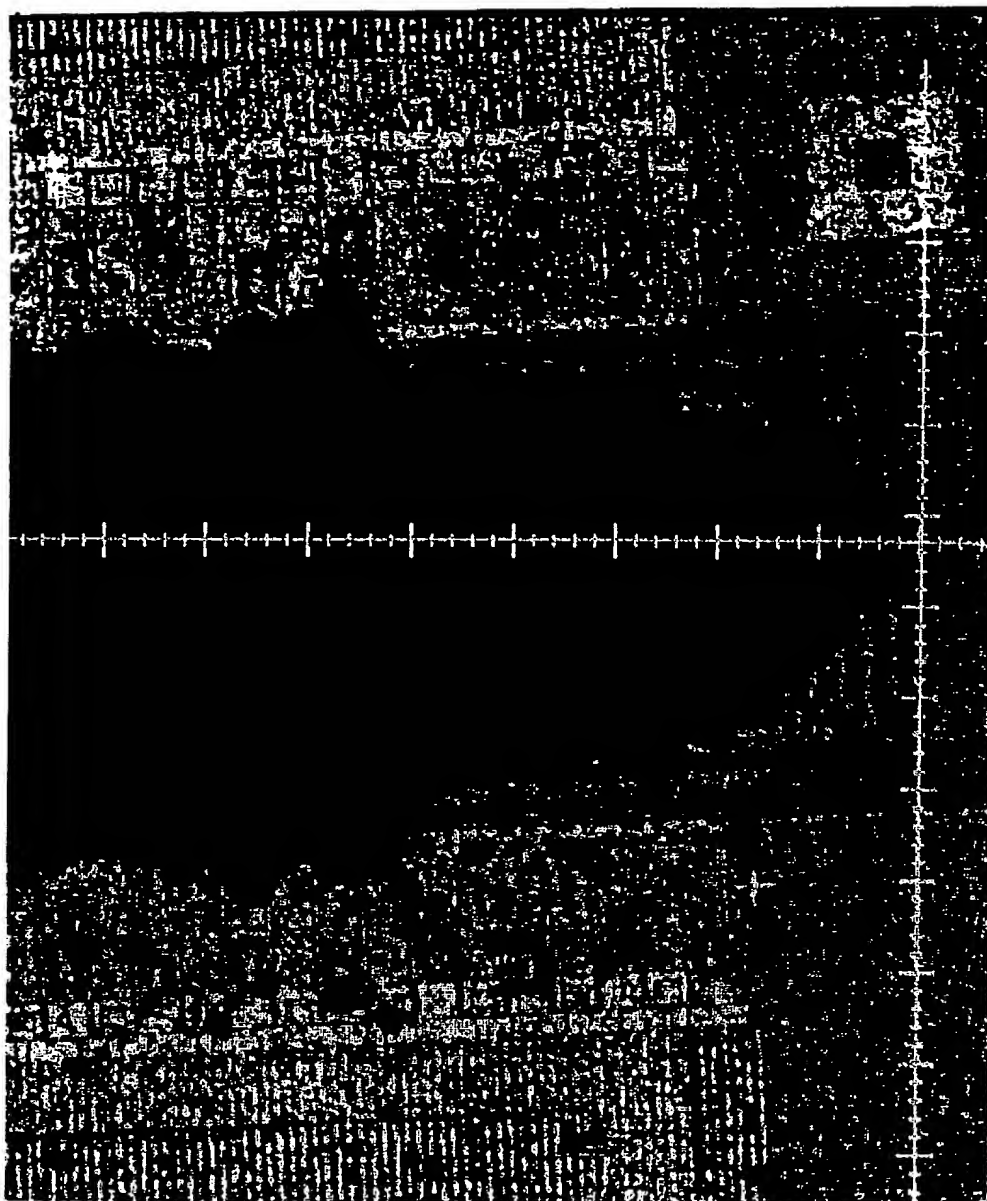
SW4XA05Y MAPLE WARE
7% PEO COATED BEFORE GRITBLAST
NOT WASHED.

Fig. 1



SW4KASSY
7% PEO COATED BEFORE GRIT BLAST
NOT WASHED.

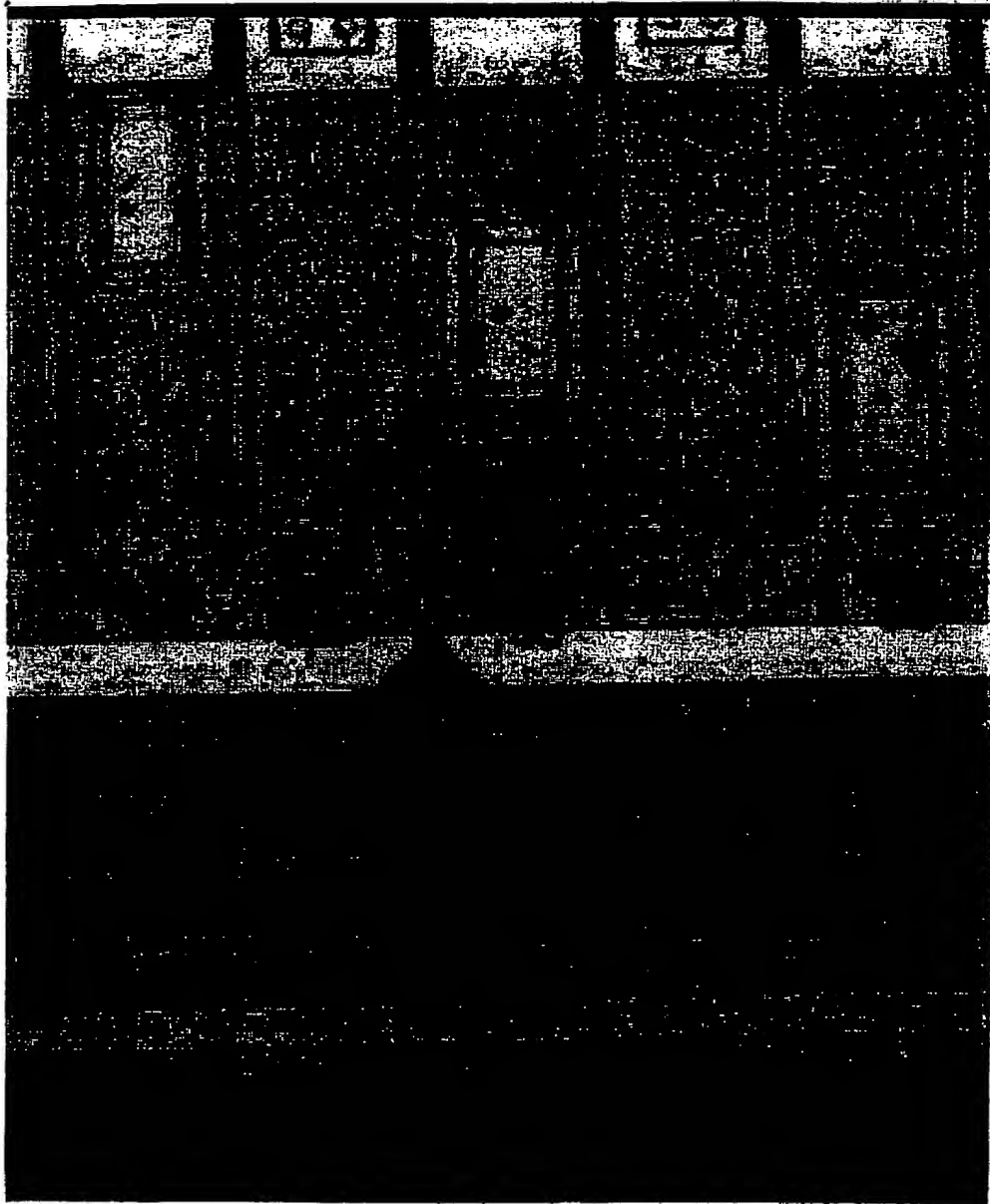
Fig. 2



SW4XA05.Y

7% PEO COATED BEFORE GRITBLAST
NOT WASHED

Fig. 3



Maple chips 7% PEO coating after
RIE Run #1 washed ~~with~~

Fig. 4